CLAIMS

We claim:

1. A ceramic arc tube comprising: a discharge vessel having at least one capillary having an electrode assembly, the capillary extending outwardly from the discharge vessel to a distal capillary end, the electrode assembly being hermetically sealed to the distal capillary end with a frit material, the electrode assembly passing through the capillary to the discharge chamber and being connectable to an external source of electrical power, the discharge vessel enclosing a discharge chamber containing a buffer gas and an ionizable fill material, the pressure of the buffer gas being from 2 bar to 8 bar.

2. The ceramic arc tube of claim 1 wherein the buffer gas pressure is from 2 bar to 10 bar.

3. The ceramic arc tube of claim 1 wherein the buffer gas pressure exceeds 10 bar.

4. The ceramic arc tube of claim 1 wherein the discharge vessel is comprised of a sapphire tube and the capillary is comprised of polycrystalline alumina.

5. The ceramic arc tube of claim 4 wherein the capillary is part of an end cap which has been hermetically sealed to the sapphire tube.

6. The ceramic arc tube of claim 5 wherein the end cap has an annular rim which fits over an open end of the sapphire tube.

7. The ceramic arc tube of claim 1 wherein the buffer gas is argon, krypton, xenon or a mixture thereof.

8. The ceramic arc tube of claim 1 wherein the buffer gas comprises xenon.

9. The ceramic arc tube of claim 8 wherein the buffer gas pressure is from 2 bar to 10 bar.

10. An apparatus for making a ceramic arc tube comprising:

a pressure jacket having a pressure chamber containing an RF susceptor, the susceptor having an opening for receiving a capillary of the arc tube, an RF induction coil situated external to the pressure jacket and surrounding the RF susceptor, the RF induction coil being connected to an RF power source;

the pressure chamber being connected to a source of pressurized buffer gas and a vacuum source, the source of pressurized buffer gas being regulated by a valve connected to a pressure controller having a pressure sensor for measuring the pressure in the pressure chamber;

a holder having a support for the arc tube, the height of the support being selected to cause an unsealed end of the arc tube to be positioned within the RF susceptor when the holder is sealed to the apparatus; and

the apparatus when sealed being capable of alternately evacuating the pressure chamber and filling the pressure chamber with buffer gas.

11. The apparatus of claim 10 wherein the susceptor is a hollow graphite cylinder.

12. The apparatus of claim 11 wherein the susceptor is secured in the pressure chamber by alumina spacers.

13. The apparatus of claim 10 wherein the induction coil is embedded in a cooling block.

14. The apparatus of claim 13 wherein the cooling block is an aluminum nitride/boron nitride composite material.

15. The apparatus of claim 10 wherein a thermal shield is positioned between the RF susceptor and the RF induction coil.

16. The apparatus of claim 10 wherein the edges of the susceptor are blunted to reduce electric field enhancement.

17. The apparatus of claim 10 wherein the induction coil is operated in a single-ended mode.

18. The apparatus of claim 10 wherein the induction coil is operated in a differential mode.

19. The apparatus of claim 15 wherein the thermal shield comprises a multi-layer ceramic infra-red-reflecting material.

20. The apparatus of claim 15 wherein the thermal shield comprises a thin metal film having gaps parallel to the axis of the pressure chamber.

21. The apparatus of claim 10 wherein the pressure jacket is releasably sealed to a base mounted to a manifold, the manifold having ports for connecting to the source of pressurized buffer gas and the vacuum source, the base and the manifold each having a bore there through to allow an arc tube to be inserted into the pressure chamber, the manifold being releasably sealed to the holder.

22. The apparatus of claim 10 wherein the pressure jacket is comprised of fused silica.

23. The apparatus of claim 10 wherein the RF power source has a frequency of 27.12 MHz.

24. The apparatus of claim 10 wherein the RF power source has an RF matching network which minimizes the reflected power.

25. The apparatus of claim 23 wherein the RF power source has a power output of less than 300 watts.

26. A method for sealing a ceramic arc tube comprising:

(a) sealing the arc tube within a pressure chamber, the arc tube comprising a discharge vessel and at least one capillary, the capillary extending outwardly from the discharge vessel to a distal capillary end having a frit material, the chamber containing an RF susceptor surrounding the distal capillary end;

(b) filling the chamber with a buffer gas to a predetermined pressure; and

(d) heating the RF susceptor by energizing an RF induction coil with an RF power source, the RF induction coil being external to the chamber and surrounding the RF susceptor, the heat generated by the RF susceptor causing the frit material to melt and flow into the distal capillary end; and

(e) cooling the frit material to form a hermetic seal.

27. The method of claim 26 wherein the pressure of the buffer gas is increased at a rate equal to or slightly greater than the pressure of the buffer gas in the discharge vessel.

28. The method of claim 26 wherein an overpressure differential is used to achieve a frit penetration depth.

29. The method of claim 26 wherein the buffer gas pressure is from 2 bar to 8 bar.

30. The method of claim 26 wherein the buffer gas pressure is from 2 bar to 10 bar.

31. The method of claim 26 wherein the buffer gas pressure exceeds 10 bar.